



## 299-E33-69 (A6877)

### **Log Data Report** (REVISED)

#### **Borehole Information:**

<b>Borehole:</b> 299-E33-69 (A6877)		<b>Site:</b> 216-B-8 Crib			
<b>Coordinates (WA State Plane)</b>		<b>GWL<sup>1</sup> (ft):</b> n/a <sup>2</sup>	<b>GWL Date:</b> n/a		
<b>North (m)</b> 137455	<b>East (m)</b> 573786	<b>Drill Date</b> Dec. 1947	<b>TOC<sup>3</sup> Elevation (ft)</b> 643.30	<b>Total Depth (ft)</b> 150	<b>Type</b> unknown

#### **Casing Information:**

<b>Casing Type</b>	<b>Stickup (ft)</b>	<b>Outer Diameter (in.)</b>	<b>Inside Diameter (in.)</b>	<b>Thickness (in.)</b>	<b>Top (ft)</b>	<b>Bottom (ft)</b>
Steel	2.95	8.625	8.0	0.3125	0	145

#### **Borehole Notes:**

The logging engineer measured the pipe stickup at the borehole using a steel tape. Calipers were used to measure casing outside diameter and thickness; the casing inside diameter is calculated. The drilling date and casing depth are derived from *Hanford Wells* (Chamness and Merz 1993). Coordinates and TOC elevation are derived from HWIS<sup>4</sup>.

#### **Logging Equipment Information:**

<b>Logging System:</b> Gamma 1D	<b>Type:</b> SGLS (35%)
<b>Calibration Date:</b> 07/01	<b>Calibration Reference:</b> GJO-2001-243-TAR
	<b>Logging Procedure:</b> MAC-HGLP 1.6.5
<b>Logging System:</b> Gamma 1C	<b>Type:</b> HRLS
<b>Calibration Date:</b> 02/02	<b>Calibration Reference:</b> GJO-2002-309-TAR
	<b>Logging Procedure:</b> MAC-HGLP 1.6.5

#### **Spectral Gamma Logging System (SGLS) Log Run Information:**

<b>Log Run</b>	<b>1</b>	<b>2</b>	<b>3</b>		
Date	10/4/01	10/5/01	10/8/01		
Logging Engineer	Musial	Musial	Musial		
Start Depth (ft)	3.0	150.0	65.0		
Finish Depth (ft)	66.0	83.0	84.0		
Count Time (sec)	100	100	100		
Live/Real	R	R	R		
Shield (Y/N)	N	N	N		
MSA Interval (ft)	0.5	0.5	0.5		
ft/min	n/a	n/a	n/a		
Pre-Verification	A0008CAB	A0009CAB	A0010CAB		
Start File	A0008000	A0009000	A0010000		
Finish File	A0008126	A0009134	A0010038		
Post-Verification	A0008CAA	A0009CAA	A0011CAA		

Log Run	1	2	3		
Depth Return Error (ft)	0	0.15	0		
Comments	No fine gain adjustments.	No fine gain adjustments.	No fine gain adjustments.		

### **High Rate Logging System (HRLS) Log Run Information:**

Log Run	1	2			
Date	03/14/02	03/19/02			
Logging Engineer	Kos	Kos			
Start Depth (ft)	27.0	38.0			
Finish Depth (ft)	39.0	50.0			
Count Time (sec)	300	300			
Live/Real	R	R			
Shield (Y/N)	N	N			
MSA Interval (ft)	0.5	0.5			
ft/min	n/a	n/a			
Pre-Verification	D0027CAB	D0028CAB			
Start File	D0027000	D0028000			
Finish File	D0027024	D0028024			
Post-Verification	D0027CAA	D0029CAA			
Depth Return Error (ft)	- 0.25	0.0			
Comments	No fine gain adjustments.	No fine gain adjustments.			

### **Logging Operation Notes:**

SGLS and HRLS logging were performed in this borehole during October 2001 and March 2002, respectively. The reference depth for logging measurements is the top of casing. The HRLS was utilized to perform logging in high gamma flux zones, generally where the SGLS dead time exceeded 40 percent. No repeat sections were collected in this borehole.

### **Analysis Notes:**

<b>Analyst:</b>	SS/PH	<b>Date:</b>	03/26/02	<b>Reference:</b>	MAC-VZCP 1.7.9, Rev. 2
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This Log Data Report is a revision of the report originally issued 01/11/02. This revision includes high rate data analysis results that were not previously reported and replaces the original Log Data Report.

Pre-run and post-run verification spectra for the SGLS were evaluated. The acceptance criteria for field verification of the Gamma 1D logging system are in the process of being established. Examinations of spectra indicate that the detectors appear to have functioned normally during the log runs, and the log data are provisionally accepted, subject to further review and analysis. Data in the HRLS post-run verification file D0029CAA were lost. The other HRLS verification data passed acceptance criteria.

A casing correction for 0.3125-in.-thick casing was applied to the log data.

Each spectrum collected during a log run was processed in batch mode using APTEC Supervisor to identify individual energy peaks and determine count rates. Concentrations were calculated in EXCEL, using an efficiency function and corrections for casing and dead time determined in calibrations. EXCEL templates named G1dJul01.xls and G1cFeb02.xls were used to process the SGLS and HRLS data, respectively. Dead time corrections are applied to log data, including the total gamma data, where the dead time is in excess of 10.5 percent. In zones of high dead time (>40 %), gross count rates and radionuclide concentrations

become increasingly less reliable, and may be significantly higher than the reported values. The HRLS is used in zones of high SGLS dead times to quantify the  $^{137}\text{Cs}$  concentrations. The  $^{214}\text{Bi}$  peak at 1764 keV was used to determine the naturally occurring  $^{238}\text{U}$  concentrations rather than the  $^{214}\text{Bi}$  peak at 609 keV. The 609-keV energy peak cannot be distinguished as a result of interference from the  $^{137}\text{Cs}$  peak at 662 keV in higher concentration zones.

### **Log Plot Notes:**

Separate log plots are provided for the man-made radionuclide ( $^{137}\text{Cs}$ ), naturally occurring radionuclides ( $^{40}\text{K}$ ,  $^{238}\text{U}$ , and  $^{232}\text{Th}$  [KUT]), a combination of man-made, KUT, total gamma and dead time, and a plot of total gamma and dead time. Data collected with the HRLS are substituted for SGLS data where appropriate to provide a continuous record of the most accurate  $^{137}\text{Cs}$  concentrations.

For each radionuclide, the energy value of the spectral peak used for quantification is indicated. Unless otherwise noted, all radionuclides are plotted in picocuries per gram (pCi/g). The open circles indicate the minimum detectable level (MDL) for each radionuclide. Error bars on each plot represent error associated with counting statistics only and do not include errors associated with the inverse efficiency function, dead time correction, or casing correction.

### **Results and Interpretations:**

The man-made radionuclide detected in this borehole was  $^{137}\text{Cs}$ . A zone of  $^{137}\text{Cs}$  contamination was detected near the ground surface (log depth 3.0 through 8.0 ft) with activities ranging from 0.3 to 53.3 pCi/g.  $^{137}\text{Cs}$  also was detected between 25.5 and 115.0 ft. The highest concentrations were measured between 28.5 and 49.5 ft, where high SGLS dead time occurred. HRLS data are substituted in this interval. The maximum concentration measured by the HRLS was about 50,000 pCi/g at 30.5 ft in depth. At the bottom of the borehole (150.0-ft log depth),  $^{137}\text{Cs}$  was detected with an activity of 0.6 pCi/g and may be contamination that blew into the borehole.

Above the zone of intense gamma-ray activity, apparent  $^{40}\text{K}$  activities are about 12 pCi/g. Within the zones of intense gamma-ray activity, apparent  $^{40}\text{K}$  activities are about 18 pCi/g. The relatively high concentrations of  $^{137}\text{Cs}$  below about 30 ft may correspond with the increase in  $^{40}\text{K}$  activities and the transition from the coarse-grained sediments of the Hanford H1 to the finer grained sediments of the Hanford H2.

### **References:**

Chamness, M.A. and J.K. Merz, 1993. *Hanford Wells*, PNL-8800, prepared by Pacific Northwest Laboratory for the U.S. Department of Energy.

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<sup>1</sup> GWL – groundwater level

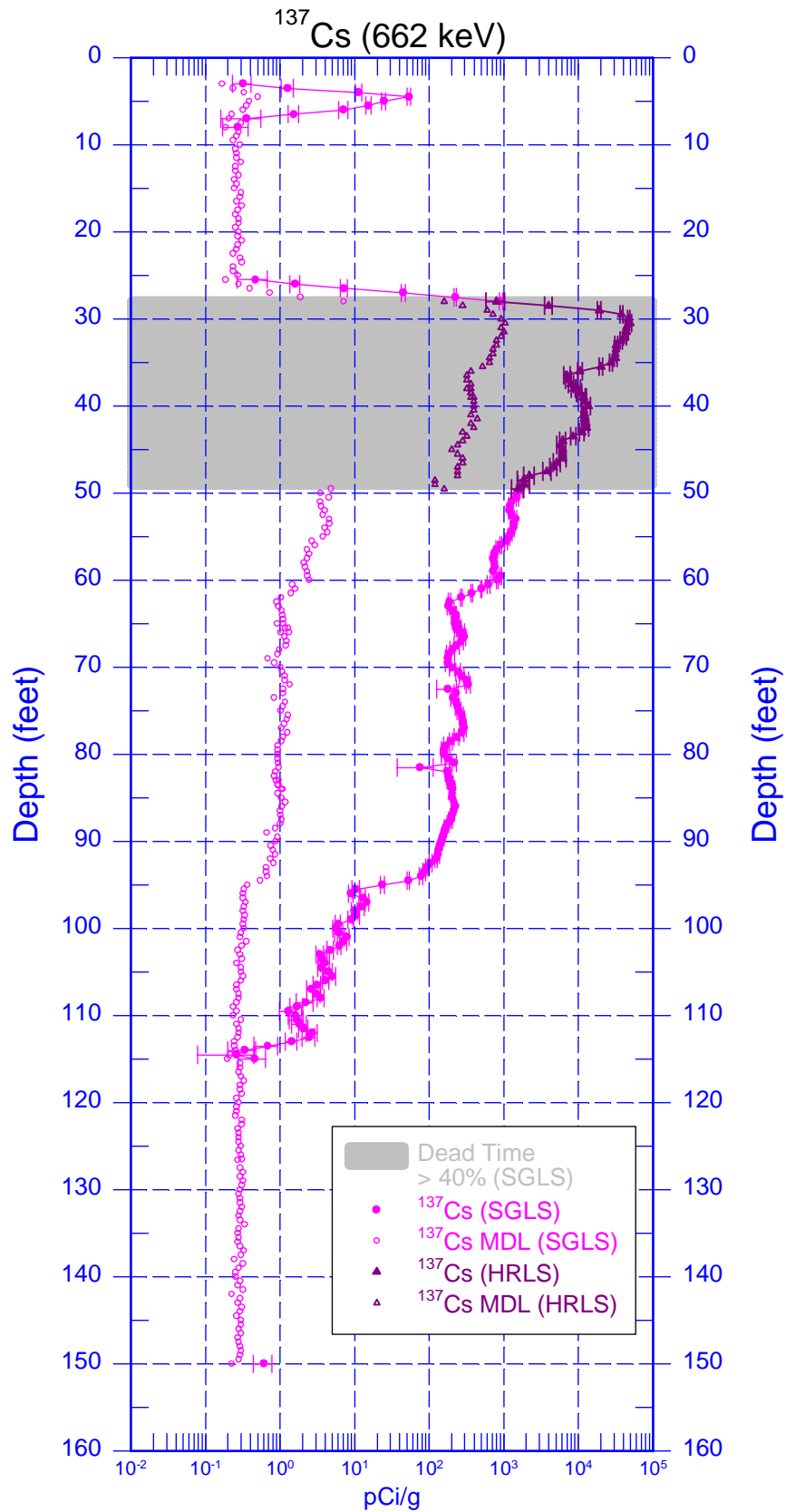
<sup>2</sup> n/a – not applicable

<sup>3</sup> TOC – top of casing

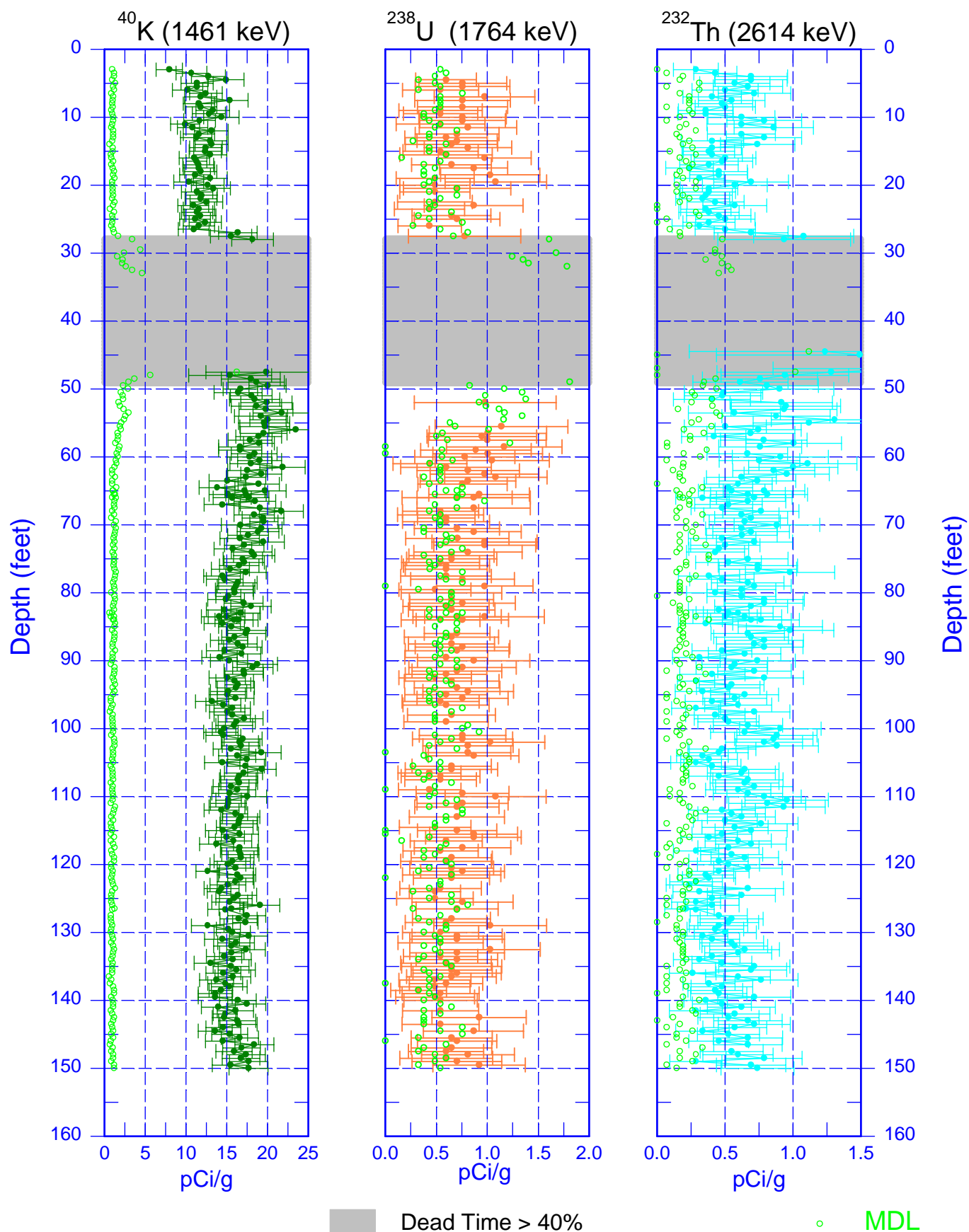
<sup>4</sup> HWIS – Hanford Well Information System

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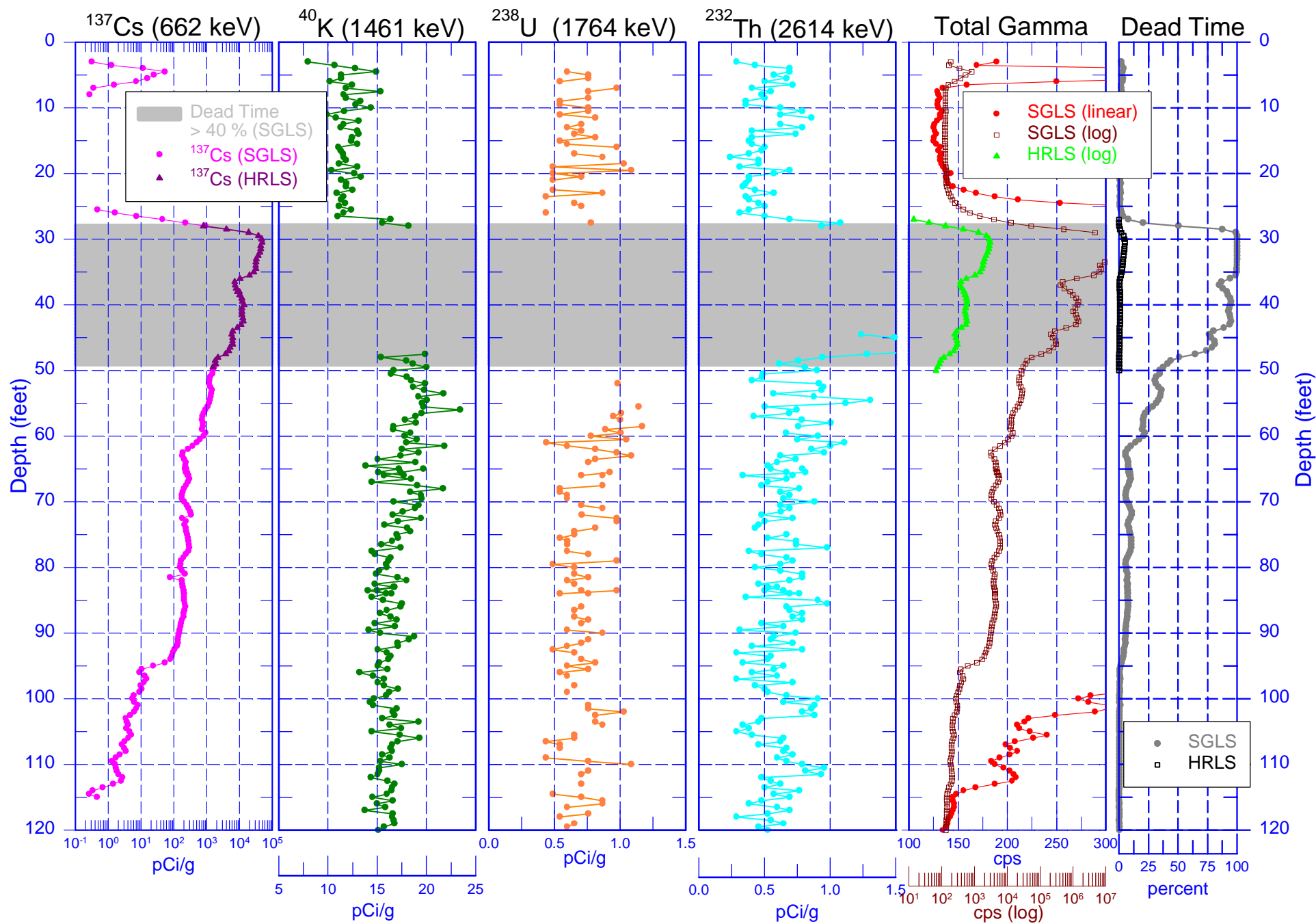
## Man-Made Radionuclide



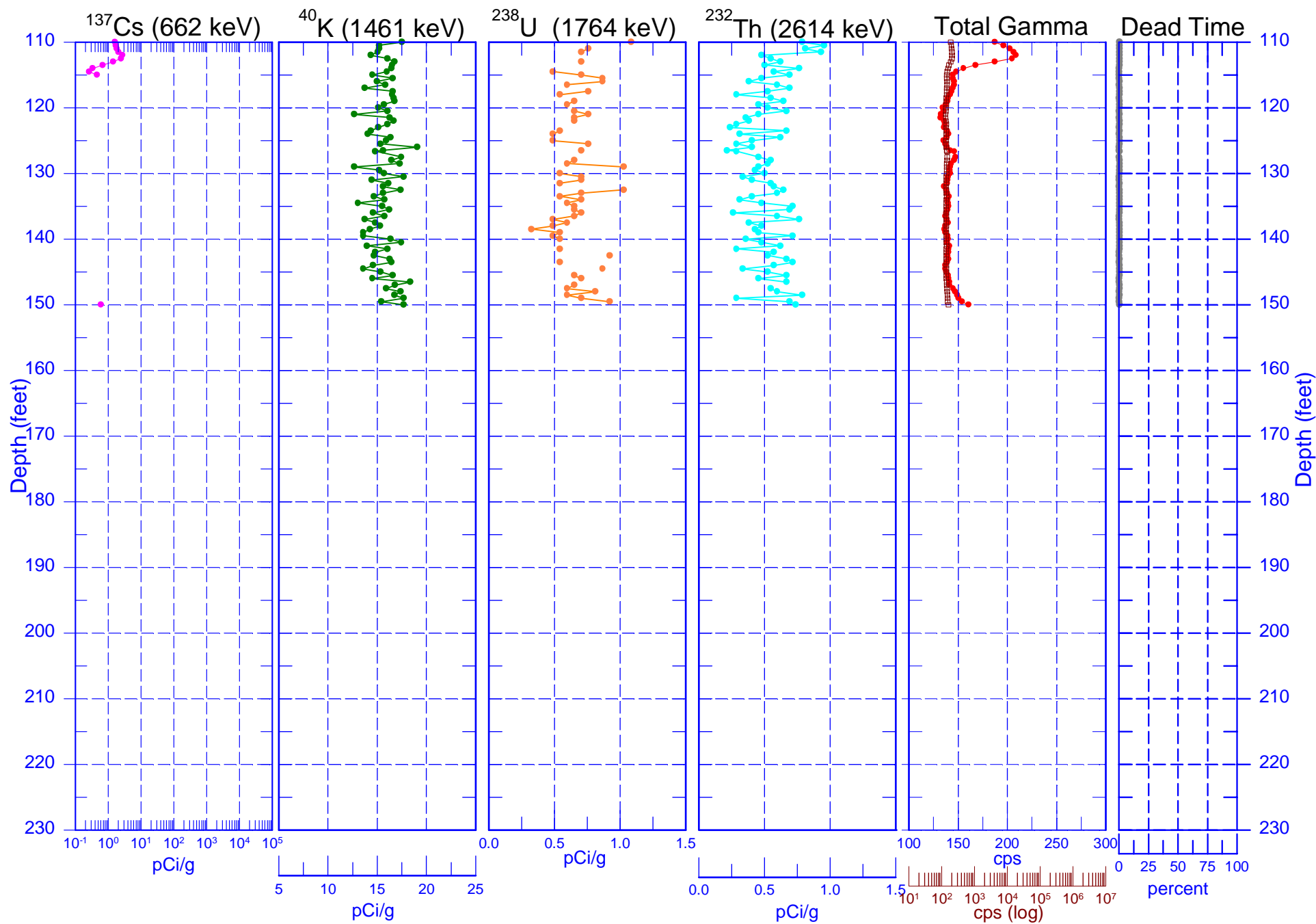
# 299-E33-69 (A6877) Natural Gamma Logs



# 299-E33-69 (A6877) Combination Plot



# 299-E33-69 (A6877) Combination Plot



# 299-E33-69 (A6877)

## Total Gamma & Dead Time

